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FLOOD INSURANCE STUDY

ORIGINAL

TOWN OF THUNDERBOLT, GEORGIA

CHATHAM COUNTY

JULY 2, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER-130420

(22)

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

TOWN OF THUNDERBOLT,
CHATHAM COUNTY,
GEORGIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Thunderbolt, Chatham County, Georgia, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study revises and supersedes a previous Flood Insurance Study for the Town of Thunderbolt. This information will be used by the community to update existing flood plain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land used and flood plain development.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, Federal Emergency Management Agency, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

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The hydrologic and hydraulic analyses for this study were obtained from the Type 19 Flood Insurance Study for the Unincorporated Areas of Chatham County, Georgia (Reference 1).

1.3 Coordination

On November 19, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Thunderbolt, Chatham County, Georgia. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data. A detailed coastal flooding analysis was performed on the Atlantic Ocean where flooding propagates inland to affect the Town of Thunderbolt.

2.2 Community Description

The Town of Thunderbolt is located in north-central Chatham County in eastern Georgia. Thunderbolt is bordered by the City of Savannah on the northwest and by the unincorporated areas of Chatham County on the north, east, south, and part of the western corporate limits. U.S. Route 80 passes through Thunderbolt. Similarly, the Intracoastal Waterway within the Wilmington River passes through Thunderbolt. In 1980, the population was reported to be 2,165 (Reference 2).

The mean temperatures in Chatham County range from a low of 50 degrees Fahrenheit (F.) in January to a high of 75 degrees F. in July. Average annual rainfall is 48 inches, with the summer months receiving the most precipitation. Natural vegetation consists mostly of southern mixed forest made up of pine, gum, oak, and cypress trees (Reference 3).

2.3 Principal Flood Problems

Chatham County is subject to flooding caused by hurricanes and tropical storms. Major storms and hurricanes caused flooding in 1871, 1881, 1885, 1893, 1896, 1898, 1911, 1940, 1944, 1947, 1952, 1959, and 1979 (References 4, 5, and 6). The highest surges occurred during the hurricanes of 1881 and 1893, which caused flood heights up to 16 and 19 feet mean sea level (msl), respectively, in Savannah Beach (References 4 and 5).

The primary factors contributing to flooding in Chatham County are its openness to Atlantic Ocean surges and unfavorable bathymetry extending offshore. Many of the large streams near the coast have wide mouths and are bordered by extensive areas of low marsh. In addition, the terrain at the coast is generally too low to provide an effective barrier. The offshore ocean depths are shallow for great distances, generating a high Atlantic Ocean surge.

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FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA

(CHATHAM CO.)

APPROXIMATE SCALE

4000 0 4000 8000 12000 FEET

VICINITY MAP

A storm history of Chatham County and its vicinity during the past 100 years is summarized below. Damage figures are determined in dollar values at the time of the storm. No attempt has been made to adjust these figures to current dollar values.

August 16-19, 1871

A tropical cyclone moved overland from Florida and caused damage along the Florida, Georgia, and South Carolina coasts. At Savannah, Georgia, the wind speed was 72 miles per hour (mph) from the north.

August 21-29, 1881

This storm reached hurricane intensity northeast of Puerto Rico on August 22. The lowest barometric pressure reading was 29.08 inches. The storm center entered the coast south of Savannah on August 27. Damage in Savannah was estimated at $1.5 million. Approximately 335 people were killed in and near the city. Nearly 100 vessels were wrecked along the Atlantic coast. Damage was very heavy on Tybee Island, Georgia, and other coastal islands near Savannah. The highest tide observed was estimated to reach an elevation of 16.5 feet msl at Savannah Beach, approximating a flood of at least a 100-year magnitude.

August 21-26, 1885

This storm moved inland north of Savannah on August 25. It caused heavy damage in North and South Carolina. Total damage was estimated at about $1.7 million. Damage inflicted by this storm in Georgia was relatively light.

August 15-September 2, 1893

This major hurricane, which originated near the Cape Verde Islands, reached the Georgia coast on August 27. It was accompanied by a tremendous storm wave that submerged the islands along the Georgia and South Carolina coasts. Between 2,000 and 2,500 people lost their lives on the coastal islands and in the lowland between Tybee Island and the City of Charleston, South Carolina. Property damage along the Atlantic coast was estimated at $10 million. Nearly every building on Tybee Island was damaged and the railroad to the island was wrecked. The highest tide known to have occurred in the county was estimated to have a range of 17.0 to 19.5 feet msl at Savannah Beach.

September 22-29, 1896

This hurricane entered the northwestern Florida coast near St. Mark. Its center passed through southeastern Georgia and South Carolina on September 28 and 29. Hurricane winds persisted when the hurricane moved inland. Savannah recorded maximum winds of 75 mph. Damage in Savannah was estimated at $1 million. Damage was also heavy on Tybee Island and over much of southeastern Georgia. Because the damaging hurricane wind was of a short duration near Chatham County and occurred during a low tide period, destruction caused by storm surge was relatively light compared with the hurricanes of 1881 and 1893.

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August 30-September 1, 1898

This hurricane entered the Georgia-South Carolina coast on August 30. Its center passed over Tybee Island. Winds on Tybee Island were estimated at 100 mph. The storm surges were not high enough to cause extensive damage; however, the hurricane was accompanied by very heavy rain, and the countryside was flooded for 100 miles around Savannah. Most roads and railroads were impassable because of high water.

August 23-30, 1911

The center of this hurricane entered the coast between Savannah and Charleston on August 28. A maximum wind of 88 mph from the northwest was recorded at Savannah. Damage in the Savannah area was remarkably low; however, property on Tybee Island was heavily damaged. Excessive rains accompanied the storm and caused considerable damage to roads, crops, and other property throughout southern Georgia.

August 5-15, 1940

This was the first hurricane to affect Georgia since August 1911. Its center entered the South Carolina coast to the north of Savannah on August 11. The wind at Savannah reached 73 mph, and damage in the Savannah area was estimated at $850,000. The highest tide observed at Beaufort, South Carolina, was estimated to be 12.4 feet msl. High tides of 7.4 and 6.4 feet msl were recorded at Fort Pulaski, Georgia, and at Fort Jackson, Savannah Harbor, Georgia, respectively.

October 12-23, 1944

This hurricane entered the gulf coast of Florida and moved northeastward across the peninsula. Its center crossed the east coast near Jacksonville, Florida, in a north-northeast direction and moved inland again near Savannah. The hurricane was downgraded to a tropical storm by the time it reached Georgia. The highest tide, 5.9 feet msl along the Georgia coast, was observed at Fort Pulaski, near the mouth of the Savannah River. The estimated damage in Georgia was $500,000.

October 9-16, 1947

The center of this hurricane entered the Georgia coast just south of Savannah on October 15. At Savannah, the maximum wind speed was 77 mph, and the lowest barometric pressure was 28.77 inches. Heavy lossses were sustained at Savannah and Savannah Beach, where more than 1,500 buildings were substantially damaged. Total damage in the coastal area was estimated at more than $2 million. The highest tide, 7.9 feet msl, was recorded at Fort Jackson.

August 18-September 2, 1952 (Hurricane Able)

Hurricane Able moved inland on August 30. Its center passed near Beaufort with maximum winds of approximately 100 mph. Damage from this storm was estimated at about $2.8 million.

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September 20-October 2, 1959 (Hurricane Gracie)

Hurricane Gracie moved inland on September 29. Its center passed over the South Carolina coast near the City of Beaufort, South Carolina. Wind gusts of hurricane force were felt in the Savannah area, and damage was inflicted over the upper Georgia coastal area. The total damage inflicted by the storm was estimated at $14 million with damage in Georgia estimated at more than $500,000. High-water marks, which were reported near Edisto Beach, South Carolina, ranged from 7.3 to 11.9 feet msl.

August 25-September 7, 1979 (Hurricane David)

Hurricane David was the most intense storm of the century to affect the islands of the eastern Carribean. However, the storm was not a major hurricane when it struck the United States. David struck just north of Palm Beach, Florida, on September 3 and made a second landfall about 24 hours later near Savannah Beach. In the United States, David was responsible for five deaths and about $300 million in damages. The death toll and damage were much greater in Dominica, Cuba, and the Dominican Republic (Reference 6).

2.4 Flood Protection Measures

Due to the parameter of this existing data study, information regarding flood protection measures in the community is obtained only from the source report (Reference 1) and any other readily available sources. None of these sources provided information relating to the flood protection measures in the community.

Levees exist in the study area that provide the community with some degree of protection against flooding. However, it has been ascertained that these levees may not protect the community from rare events such as the 100-year flood. The criteria used to evaluate protection against the 100-year flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 100-year flood are not considered in the hydraulic analysis of the 100-year flood plain.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk

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increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail.

Inundation from the Atlantic Ocean caused by passage of storms (storm surge) was determined by the joint probability method (Reference 7). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the Town of Thunderbolt. Primary sources of data for this were "Tropical Cyclone Card Deck 993" (Reference 8), "Tropical Cyclones of the North Atlantic Ocean, 1871-1980" (Reference 9), "Tropical Cyclones of the North Atlantic Ocean" (Reference 10), and "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" (Reference 11). A summary of the parameters used for the area is presented in Table 1, Parameter Values for Surge Elevations.

For areas subject to flooding directly from the Atlantic Ocean, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 12).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the Town of Thunderbolt and are shown in Table 2, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects and include the contributions from wave action effects.

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines. All dunes and structures were assumed to remain intact for purposes of these analyses.

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CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7			11			15
PROBABILITIES:[1]	0.45			0.30			0.25
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)			327		301		
PROBABILITY[1]			0.51		0.49		
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.00107		20[2] 0.0012		25[3] 0.00124		70[3] 0.00131

[1]AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2]NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3]NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA
(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS
(ENTERING HURRICANES)

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CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7			11			15
PROBABILITIES:[1]	0.32			0.30			0.38
DIRECTION OF STORM PATH[1] (DEGREES FROM TRUE NORTH)				35			
PROBABILITY				1.0			
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.0039[4] 0.0042[5]		20[2] 0.0045[4] 0.0048[5]		25[3] 0.0051[4] 0.0054[5]		70[3] 0.0058[4] 0.0061[5]

[1]AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2]NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3]NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[4]15 NAUTICAL MILES OFFSHORE
[5]45 NAUTICAL MILES OFFHSORE

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA
(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS
(ALONGSHORE HURRICANES)

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CENTRAL PRESSURE DEPRESSION (MILLIBARS)	83	67	53	42	33	23	9
ASSIGNED PROBABILITIES[1]	0.03	0.08	0.11	0.13	0.16	0.29	0.20
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			20			28
PROBABILITY[1]	0.24			0.26			0.50
FORWARD SPEED (KNOTS)	7						13
PROBABILITIES:[1]	0.45						0.55
DIRECTION OF STORM PATH[1] (DEGREES FROM TRUE NORTH)			54		94		
PROBABILITY[1]			0.75		0.25		
FREQUENCY OF STORM OCCURRENCE (STORM/NAUTICAL MILE/YEAR)	65[2] 0.0026		20[2] 0.0013		25[3] 0.00069		70[3] 0.00056

[1]AVERAGE OF DIFFERENT STORM TRACK LOCATIONS
[2]NAUTICAL MILES SOUTH OF GEORGIA-SOUTH CAROLINA BOUNDARY
[3]NAUTICAL MILES NORTH OF GEORGIA-SOUTH CAROLINA BOUNDARY

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA
(CHATHAM CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS
(EXITING HURRICANES)

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FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
ATLANTIC OCEAN					
Along Wilmington River and Grays Creek	1	10.3	12.5	13.0	15.5

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA

(CHATHAM CO.)

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN

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The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 8 by 5 nautical miles and 6,000 feet by 6,000 feet, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from the National Oceanic and Atmospheric Administration nautical charts, U.S. Geological Survey topographic maps, aerial photogrammetry, and field surveys (References 13-16).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 17). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 17. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 2. Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 18). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. Table 3 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

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FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF THUNDERBOLT, GA

(CHATHAM CO.)

APPROXIMATE SCALE

4000 0 4000 8000 12000 FEET

TRANSECT LOCATION MAP

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TABLE 3 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
1	across Cabbage Island approximately 1 mile east of the mouth of the Wilmington River, ending in the Town of Thunderbolt	13.0	20.1

Figure 3 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the A/V zone boundary.

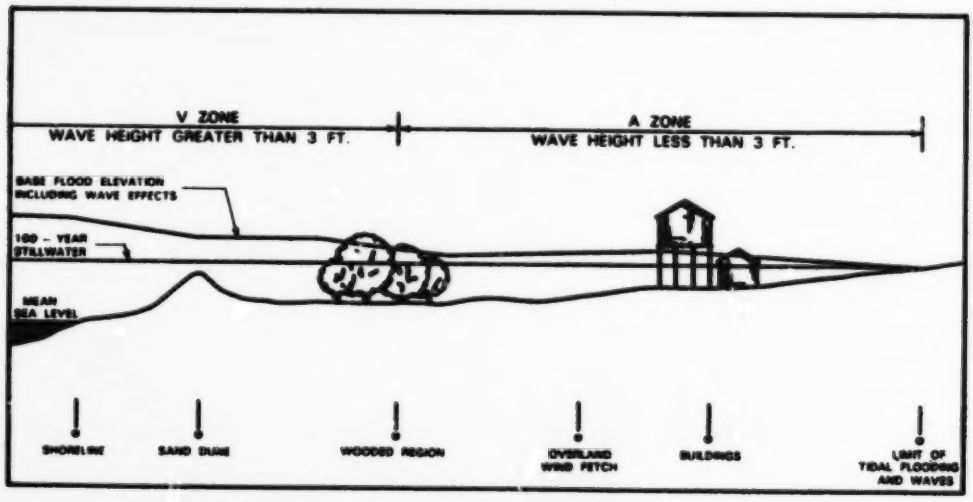

FIGURE 3 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (Reference 15), aerial photographs (Reference 16), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

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4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the 100- and 500-year flood boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 15).

The 100- and 500-year flood plain boundaries are shown on tne Flood Insurance Rate Map. On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, area of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studies by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction

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with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols the 100-year and 500-year flood plains.

7.0 OTHER STUDIES

Flood Insurance Studies for the Unincorporated Areas of Chatham County and the City of Savannah (References 1 and 19) are in agreement with this study.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for the Municipality of Thunderbolt (Reference 20).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

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18. Federal Emergency Management Agency, Users Manual for Wave Height Analysis, revised February 1981.

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ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	30.23	U.S. Coast and Geodetic Survey disk in top of north bridge sidewalk at east end of Victory Drive bridge over the Wilmington River
2	0001	13.87	U.S. Coast and Geodetic Survey disk in top of east end of concrete banister on north side of Victory Drive about 0.5 mile west of Victory Drive bridge over the Wilmington River

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